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Modeling of psec-laser-driven Ne-like and Ni-like X-ray lasers

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Abstract - This paper models recent experiments in which a solid titanium target was illuminated by several joules of combined energy from a nsec laser pulse to create a preplasma followed by a psec laser pulse to drive the gain. Gains greater than 200 cm^{-1} are predicted for the Ne-like Ti 3p $^1S_0 \rightarrow 3s\ ^1P_1$ transition at 326 Å which is driven by the monopole collisional excitation. High gain is also predicted for the 3d $^1P_1 \rightarrow 3p\ ^1P_1$ transition at 301 Å which is driven by a combination of collisional excitation and self photopumping. We also discuss the possibilities for driving a Ne-like Ge laser using this approach.

For the Ni-like ions we model a solid molybdenum target under similar conditions used for Ti and predict gains greater than 300 cm^{-1} for the Ni-like Mo 4d $^1S_0 \rightarrow 4p\ ^1P_1$ transition at 18.9 nm which is driven by the monopole collisional excitation. High gain is also predicted for a self photopumped 4f $^1P_1 \rightarrow 4d\ ^1P_1$ transition at 22.0 nm and several other transitions driven by inner shell collisional ionization.

Biography - Dr. Nilsen has a B. S. in Engineering Physics from Cornell University and a Ph. D. in Physics from the California Institute of Technology where he did a thesis on Phase Conjugation via Four-Wave Mixing in a Resonant Medium under the supervision of Dr. Amnon Yariv. Dr. Nilsen was a Hertz Fellow at the California Institute of Technology and is a member of the OSA and APS. At Lawrence Livermore National Laboratory, Dr. Nilsen has spent the last decade designing X-ray lasers and currently holds three X-ray laser patents. His work has resulted in the demonstration of the world's shortest wavelength, highest energy experimentally demonstrated laser.

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